LB-M-210 ERX

February 22, 1961

Dear Kelly:

Since our last discussion on the caging mechanism for the configuration, we have re-examined the whole problem here. We now have a somewhat different approach to submit to you for your appraisal and criticism. Let me break it down into three separate items.

1. The Frame

This is shown in the sketches as having a rectangular cross section, but will probably be made up of tubing. It is attached to the vehicle at four points and provides the main support for the configuration. We have looked rather carefully into the Y-shaped alternative which would have a connection at the rear bulkhead but the rearward leg of this Y must pass through a portion of the configuration with sufficient clearance for the angular motions. We have been unable to find a satisfactory solution for the placement of all the components which must occupy the rearward half of the platform and clear an aft leg of the frame.

2. Cagers

We feel that three cagers are required. Their function is to fix the configuration with respect to the supporting frame. They are designed to provide sufficient lift to lock the configuration in its caged position in the case of failure of the support bearing and against a 2g load. You will find a drawing of the cager which is not intended to be a design layout, but is to give you the philosophy upon which we are now proceeding. The cylinder shown in the drawing contains a spring of sufficient size to provide the caging force. It operates through a lever system which is self-locking in the caged position. I am sure there will be some modification of this lever system from the specific layout indicated so that the spring cylinder may be located inside the tubular structure of the frame, thus saving some critical space. It is intended that the connecting links between the cager arms all be in tension so that they can be minimal in weight. The spring cylinder is to be hydraulically or pneumatically operated to compress the spring and open the cager. We are still attracted to using compressed helium because of our desire to keep oil leaks from contaminating the atmosphere. Our studies also indicate that a helium storage bottle and control system would be considerably lighter in weight than the hydraulic pump, accumulator and hydraulic valves. The caging would be performed by allowing the helium to leak out at a controlled rate through a porous plug so that the spring would not shock the configuration. This would be the normal power-off position of all valves and thus would be fail safe in the event of loss of electrical power. Some devices, not yet worked out, will have to provide for inserting the caging pins after the installation of the configuration in the vehicle or conversely making the connection between the frame and vehicle after loading. It looks to me now as if we will have to load the frame into the vehicle, since it will have to be twisted sideways in order to go in. Then the configuration is loaded and attached to the frame at the center and, lastly, the caging pins are installed.

3. Vibration Isolation

The frame is attached to the aircraft through four vibration isolators of a construction shown in the third drawing. These have a resonant frequency of 4-1/2 cycles with a transmissibility of about 4 at the resonant frequency. This drops to 1 at 7 cycles and falls off at about 6 db per octave for higher frequencies. The allowed deflection at this low spring rate is to be ±1/4" with an additional 1/32" at a very much higher spring rate before coming to a solid stop. The current plan does not call for caging across these isolators; therefore, the system will be, in a sense, adrift at the low spring rate even when caged to the extent of about 1/4". Since it is possible for the configuration to take a full pitch angle within the aperture of the cager and also drive the frame to its full excursion of 1/4" in one direction at its forward end and in the other direction at its aft end, it may be necessary to put a simple stop on the rear bulkhead to prevent this motion from adding up adversely and allowing some other point of the configuration to contact the airframe. This stop would not limit the normal pitch range nor would it have to provide any caging function. Its purpose is to provide a single defined point of first contact in case of adverse summation of all the motions. This stop could be designed to have a large head and, thus, provide additional tie-down in the longitudinal direction for the crash condition.

As you will see, all of these ideas are now in a conceptual stage. We feel they are self consistent and will provide a solution to the problems as we face them. We request your suggestions and advice. We are proceeding with this plan and will develop final hardware unless you suggest improvements.

This supersedes suggestions of TWX 610-611-612.

Best personal regards.

Sincerely,

sa
attach: (3)
cc: EPK

~~Air Mail Special Delivery~~